

Curriculum Vitae

Edward William Kolb

Theoretical Astrophysics, MS 209
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Personal Data:

Birth: October 2, 1951, New Orleans, LA
Citizenship: Unites States
Family: Married, three children
Home phone: (630) 393-7058
Social Security Number: available on request

Education:

Ph.D. in Physics, 1978

- The University of Texas, Austin, Texas
- Thesis Topic: Astrophysical Limits to Weak Interaction Phenomenology
- Thesis Advisor: Professor Duane A. Dicus

B.S. in Physics, 1973

- University of New Orleans, Louisiana
- Top Graduate in Physics, 1973

Research Interests:

The major area of research is the application of particle physics to cosmology and astrophysics. Most of the work has involved the study of the very early Universe—inflation, dark matter, limits on particle properties, baryogenesis, phase transitions, axions, etc.

An additional area of activity is science education, particularly with regard to education for the general public. This activity includes writing and lecturing on cosmology.

Present Position:

- Since 1991: Scientist III, Head of Theoretical Astrophysics
Fermi National Accelerator Laboratory
Batavia, Illinois
- Since 1983: Professor of Astronomy and Astrophysics,
Enrico Fermi Institute, and the College
The University of Chicago

Previous Positions:

- 1991–present: Scientist III (highest level), Fermi National Accelerator Laboratory
- 1984–1990: Scientist II, Fermi National Accelerator Laboratory
- 1983: Scientist I, Fermi National Accelerator Laboratory
- 1981–1983: Deputy Group Leader, Theoretical Astrophysics Group
Theoretical Division, Los Alamos National Laboratory
Los Alamos, New Mexico
- 1980–1981: J. Robert Oppenheimer Research Fellow
Supervisor: Stirling A. Colgate
Los Alamos National Laboratory
Los Alamos, New Mexico
- 1978–1980: Postdoctoral Research Fellow
Supervisor: William A. Fowler
California Institute of Technology
Pasadena, California
- 1975–1978: Research Assistant, Center for Particle Theory
Supervisor: Duane A. Dicus
University of Texas
Austin, Texas

Visiting Positions:

Spring 1981	Visiting Associate Research Physicist Institute for Theoretical Physics University of California, Santa Barbara
May–June 1987	Visiting Professor University of Rome and Osservatorio Astronomico di Roma
March 1987	Visiting Professor of Physics University of Michigan
July–August 1988	Visiting Professor University of Rome and Osservatorio Astronomico di Roma
February–March 1990	Visiting Professor Osservatorio Astronomico di Roma
March–April 1990	Visiting Professor University of Sussex
January–June 1992	Program Coordinator Institute for Theoretical Physics University of California, Santa Barbara
October 2001–October 2002	Guest Professor Theory Division, CERN

Awards, Honors, and Special Lectures:

Oersted Medal Award (Highest Recognition of the American Association of Physics Teachers) – 2003
Fellow - American Academy of Arts and Sciences – 2002.
Glicksman Lecturer, Brown Commencement Forum, Brown University, May 2000.
James Arthur Lecturer, New York University, March 1999.
NSF Distinguished Lecturer, Washington, DC, March 1999.
Resnick Lecturer, Rensselaer Polytechnic University, March 1998.
Forum Fellow of the World Economic Forum, Davos, Switzerland, January 1998.
Grasselli-Brown Lecturer, Ohio University, October 1997.
Oppenheimer Lecturer, Los Alamos, New Mexico, July 1997.
Buhl Lecturer, Carnegie Mellon University, April 1997.
Eugene M. Emme Astronautical Literature Award – 1996.
Shell Key Lecturer, The University of Edinburgh, February 1994.
Third Annual Distinguished Lecturer - University of Rochester, February 1991.

Awards, Honors, and Special Lectures (continued):

Orsted Medal of the American Association of Physics Teachers – 2003

Elected to the American Academy of Arts and Sciences – 2002

Llewellyn John and Harriet Manchester Quantrell Award for Excellence in Undergraduate Teaching, The University of Chicago – 1993.

Fellow – American Physical Society – 1984.

J. Robert Oppenheimer Research Fellow - Los Alamos National Laboratory 1980–1981

Gravity Foundation Essay - Honorable Mention 1978

Member - $\text{O}\Delta\text{K}$, $\Sigma\Pi\Sigma$, $\Phi\text{K}\Phi$ National Honor Societies

Top Graduate in Physics 1973 - University of New Orleans.

Professional Activities:

Member: *American Physical Society, American Astronomical Society, International Astronomical Union*

Elected: Executive Committee of the Division of Astrophysics, American Physical Society 1993–1995

Elected: American Physical Society Executive Council, Division Councilor, Representing Division of Astrophysics 2002–2005

Referee: *Physical Review, Physical Review Letters, Physics Letters, Nuclear Physics, Nature, Science, Astrophysical Journal, NASA, NSF, DOE, NATO, Classical and Quantum Gravity, Astronomy and Astrophysics, Annals of Physics*

Editorial Board: *Nuovo Cimento*

Editorial Board: *Reports on Astrophysics and Cosmology*

Editor-in-charge for high energy physics – cosmology interface:

International Journal of Modern Physics A, Modern Physics Letters A

Divisional Associate Editor – *Physical Review Letters*

Editor – *Gravitation, Astrophysics, and Cosmology*

Editorial Advisory Board – *Astronomy* magazine

Series Editor, *High Energy Physics, Cosmology and Gravitation* Book Series, Institute of Physics Publishing Ltd., UK

Faculty Associate – *Council for International Exchange of Scholars for the Fulbright Program*

Scientific Advisory Committee, Theoretical Physics Institute, University of Minnesota.

Member of Particles Panel, National Academy of Sciences
1990 Astronomy and Astrophysics Survey.

External Advisory Committee, Center for Particle Astrophysics
NSF Science and Technology Center.

Panel Chair, NASA Long-Term Space Astrophysics Program, 1990.

Consultant, NSF review of HiRes proposal, 1991.

Physics Panel, Texas Advanced Research/Technology Program, 1991.

Adler Planetarium Council, 1993–present.

NSERC (Canada) Special Project Grant Committee, 1994

Advisory Council, Sloan Digital Sky Survey, 1998–present

Member, Board of Trustees, Adler Planetarium and Science Museum, 1998–present
Member, NASA Space Science Advisory Committee (SScAC), 1999–present.

Professional Activities (continued):

Scientific Council, Laboratoire de l'Accélérateur Linéaire, Université de Paris-Sud.

Scientific Policy Committee, Stanford Linear Accelerator Center, 2000-present.

External Advisory Committee, IceCube Project.

Chair, Structure and Evolution of the Universe Subcommittee (SEUS), NASA.

HEPAP Subpanel on Long-Range Planning (Bagger-Barish Panel), DOE and NSF, 2001

Education and Public Outreach Activities:

Teaching activities at The University of Chicago have included cosmology and astrophysics at all levels: special topics courses for graduate students, as part of the astrophysics sequence for graduate students, as an advanced course for undergraduate physics and science majors, and in a “Cosmology for Poets” course for non-science majors as part of the College evolution sequence. Teaching activities in the Cosmology for Poets course was recognized by The University of Chicago by the 1993 Quantrell Award for Excellence in Undergraduate Teaching. Educational activities outside the University include lectures to high school teachers and students, public lectures, and writing articles for a number of non-technical publications. Some of the regular educational activities are:

Harlow Shapley Visiting Lectureship Program, American Astronomical Society

Lecturer - Saturday Morning Physics Program, Fermilab

- Adler Planetarium, Chicago

- Saturday Scholars, Corridor Partnership for Excellence in Education

- Chautauqua Courses for College Teachers

- Summer Institute for Science Teachers, Fermilab

- High School Physics Program, Department of Energy

- Centennial Lecturer, American Astronomical Society

Research Grants:

- DOE High Energy and Nuclear Physics, principal investigator, 1982–1983, Los Alamos National Laboratory
- NASA Innovative Research Program, principal investigator (with Leon Lederman), 1983–1988, Fermi National Accelerator Laboratory
- NASA Astrophysics Theory Program, principal investigator (with Leon Lederman), 1988–1990, Fermi National Accelerator Laboratory
- NASA Astrophysics Theory Program, principal investigator, 1990–1992, Fermi National Accelerator Laboratory
item NASA Astrophysics Theory Program, principal investigator, 1992–1995, Fermi National Accelerator Laboratory
item NASA Astrophysics Theory Program, principal investigator, 2001–2003, Fermi National Accelerator Laboratory
- NSF US/Japan Cooperative Research Program, US principal investigator, 1989–1990, Fermi National Accelerator Laboratory

Research Grants (continued):

- NASA Astrophysics Division Educational Supplement Grant, 1992
- NASA Astrophysics Division Educational Supplement Grant, 1994
- Co-investigator on numerous other proposals for support of conferences, foreign exchange programs, etc.

Courses Taught at The University of Chicago:

Cosmology for non-science majors (recognized with the *1993 Quantrell Award for Excellence in Undergraduate Teaching*); junior-level astrophysics courses for physics majors; first-year graduate courses as part of the required courses for graduate students in the Department of Astronomy and Astrophysics; cosmology for graduate students; special topics courses for graduate students.

Postdoctoral Fellows Supervised (Fermi National Accelerator Laboratory):

NAME	Last Known Position	at Fermilab
Keith A. Olive	Prof., Univ. Minn.	7/83–8/85
David Seckel	Prof., Bartol	9/83–9/85
David Lindley	Assoc. Editor, NATURE	10/83–2/86
Lars G. Jensen	Asst. Prof., NDSU	9/84–8/86
Richard F. Holman	Assoc. Prof., CMU	9/85–6/87
Jaime A. Stein-Schabes	Physicist, Shell Oil	9/85–9/88
David P. Bennett	Scientist, LLNL	9/86–8/88
Marcelo Gleiser	Asst. Prof., Dartmouth	9/86–9/88
Albert J. Stebbins	Asst. Prof., FNAL	11/86–11/88
Edmund J. Copeland	Prof., Univ. Sussex	9/87–9/89
Angela V. Olinto	Res. Sci., Chicago	9/87–9/90
Dongsu Ryu	Asst. Prof., Daejeon	9/88–9/90
Ruth A. Gregory	Fermi Fellow, Chicago	9/88–10/91
David R. Haws	Computing, London	10/88–5/90
David Salopek	Postdoc, Cambridge	9/89–9/91
Ben-Ami Gradwohl	Postdoc, UCLA	9/90–9/92
Esteban Roulet	Postdoc, CERN	10/90–10/92
James M. Gelb	U. Texas, Arlington	10/91–2/93
H. Fay Dowker	UCSB	9/90–9/93
Scott Dodelson	Assoc. Scientist, FNAL	8/91–
Igor I. Tkachev	Ohio State	8/92–1/94
Robert R. Caldwell	Cambridge	10/92–1/94

Graduate Students Supervised:

- Terrance P. Walker, Ph.D. 1986, Department of Astronomy, Indiana University (co-supervisor: Stuart Mufson) Assistant Professor, The Ohio State University
- Frank S. Accetta, Ph.D. 1987, Department of Astronomy and Astrophysics, The University of Chicago, Postdoctoral Fellow, The University of Pennsylvania
- Lawrence Kawano, Ph.D. 1990, Department of Physics, The University of Chicago, Postdoctoral Fellow, Caltech
- Alessandro Massarotti, Ph.D. 1992, Department of Physics, The University of Chicago, Postdoctoral Fellow, Harvard University
- Sharon L. Vadas, Ph.D. 1993, Department of Physics, The University of Chicago, Presidential Fellow, University of California, Berkeley.
- Lloyd Knox, Ph.D. 1995, Department of Physics, Postdoctoral Research Fellow, Canadian Institute for Theoretical Astrophysics.
- Mark Abney, Ph.D. 1996, Department of Physics, Research Fellow in Biological Sciences, The University of Chicago.
- Daniel J. Chung, Ph.D. 1998, Department of Physics, postdoctoral fellow, CERN.
- Patrick R. Crotty, Ph.D. 2002, Department of Physics, postdoctoral fellow, Annecy, France.

Research Sponsor:

NAME	Country	Support	at Fermilab
Marcelo Gleiser	England	SERC	8/85–6/86
Nelson Pinto Neto	Brasil	CNpQ	9/85–3/86
Frédérique Grassi	France	CNRS	9/86–9/88
Sirley Marques	Brasil	CNpQ	12/86–12/88
Phillipe Jetzer	Switzerland	NSF	10/87–10/88
Armando Perez	Spain	Fullbright	9/89–9/90
Harald Patzelt	Germany	Max Kada	9/90–7/92
Sylvia Mollerach	Italy	Della Riccia	1/91–10/92
Chul Lee	Korea	KSF	2/91–1/92
Jun'ichi Yokoyama	Japan	JSPS	3/91–7/91
Enrique B. Gaztañaga	Spain	Fullbright	8/90–
Luciane R. Freitas	Brasil	CNpQ	9/91–
James E. Lidsey	England	SERC	1/93–
Marcos Maia	Brasil	CNpQ	1/93–
Vanda Silveira	Brasil	CNpQ	1/93–
Dirk Walliser	Germany	USA-Forsch.	1/93–9/93

Conference Organizer:

- Science Underground – Los Alamos National Laboratory
27-30 September 1982
- Inner Space/Outer Space – Fermi National Accelerator Laboratory
2-5 May 1984
- XIII Texas Symposium – Chicago
14-19 December 1986
- Cosmic String Workshop – Fermi National Accelerator Laboratory
11-13 December 1986
- American Association for the Advancement of Science Annual Meeting
Chicago, 14-19 February, 1987
- Convenor, American Physical Society Division of Particles and Fields
Salt Lake City, Utah 14-17 January, 1987
- International Advisory Committee – Neutrino Masses and Neutrino Astrophysics
Telemark, Wisconsin March, 1986
- Quantum Gravity Workshop – Fermi National Accelerator Laboratory
1-3 May 1987
- QCD in Astrophysics – Fermi National Accelerator Laboratory
29 April - 1 May 1988
- Astrophysics Working Group (co-leader) – Snowmass Summer Study on High Energy
Physics June - July 1988
- Wormhole Workshop – Fermi National Accelerator Laboratory
May 1989
- Cosmological Phase Transitions – Aspen Center for Physics
August 1990
- Scientific Organizing Committee – Primordial Nucleosynthesis and the Evolution of
the Early Universe Tokyo, September 1990
- Organizer, Cosmology and astrophysics parallel session, Joint International Lepton-
Photon Symposium and Europhysics Conference on High Energy Physics, Geneva,
1991
- Convener, Astrophysics, Cosmology, and Dark Matter Sessions, 1991 APS/DPF Meet-
ing, Vancouver, 1991

- Coordinator, Cosmological Phase Transition Workshop, Institute for Theoretical Physics, Santa Barbara, January–June, 1992
- Organizer, Topical Conference on Cosmological Phase Transitions, Santa Barbara, April 1992
- International Advisory Committee, IVth Rencontres de Blois, Blois, France, June 1992
- Convener, Mini workshop on Particle Cosmology, 16th Texas Symposium on Relativistic Astrophysics and 3rd Symposium on Particles, Strings, and Cosmology, Berkeley, December 1992
- Member, International Advisory Committee, Unified Symmetry in the Small and the Large, Coral Gables, January 1993
- Member, International Advisory Committee, Evolution of the Universe and Its Observational Quest, Tokyo, Japan, June 1993
- Member, International Advisory Committee, Unified Symmetry in the Small and the Large, Coral Gables, January 1994
- Organizer, Giant Array Workshop, Fermilab, March 1994
- Member, International Organizing Committee, Birth of the Universe and Fundamental Physics, Rome, Italy, May, 1994
- Organizing Committee and Cosmology Convener, Particle and Nuclear Astrophysics and Cosmology in the Next Millennium, Snowmass, Co, July 1994
- Committee of the Americas, 7th Marcel Grossman Meeting on General Relativity, Stanford, CA, July 1994
- International Advisory Committee, DPF94, Albuquerque, New Mexico, August 1994
- International Advisory Committee, Trends in Astroparticle Physics, Stockholm, September 1994
- Session Organizer, 1995 Washington APS Meeting, April 1995
- International Advisory Committee, DPF96, Minneapolis, Minnesota, November 1996
- Organizing Committee, The Early Universe Meeting, Gaeta, Italy, August 1995
- International Advisory Committee, Neutrinos, Dark Matter and the Universe, Blois, France, June 1996
- Organizer of Early Universe Session, 18th Texas Symposium on Relativistic Astrophysics and Cosmology, Chicago, December 1996.

- Scientific Committee, Birth of the Universe and Fundamental Physics II, Rome, Italy, May 1997.
- Convenor of Early Universe Session, HEP97, Jerusalem, Israel, August 1997.
- International Advisory Committee, International Workshop on Particle Physics and the Early Universe, COSMO-97, Ambleside, England, September 1997.
- Advisory Committee, Primordial Black Holes, Los Angeles, February 1998.
- Advisory Committee, Moriond '98, France, January 1998.
- Organizer, Workshop on Relic Neutrinos, Trieste, Italy, September 1998.
- Organizing Committee, Summer School on Particle Physics and Cosmology, Trieste, Italy, Summer 1998.
- Co-organizer, Pritzker Symposium and Workshop on the Status of Inflationary Cosmology, Chicago, January-February 1999.
- Advisory Committee, 10th International Baksan School "Particles and Cosmology", Baksan Valley, Kabardino-Balkaria, Russia, April 1999.
- Co-chair of Local Organizing Committee, Inner Space/Outer Space II, the David N. Schramm Memorial Symposium, Fermilab, May 1999.
- International Advisory Committee, Frontiers in High Energy and Astroparticle Physics, València, Spain, May, 1999.
- Organizing Committee, Particle Physics and the Universe, Trieste, Italy, September–October, 1999.
- International Advisory Committee, Cosmology, Relativistic Astrophysics, CosmoParticle Physics (Cosmion-99) in Honor of 80th Birthday of Isaak M. Khalatnikov, Moscow, October, 1999.
- International Advisory Committee, Strong Magnetic Fields in Neutrino Astrophysics, Yaroslavl State University, Yaroslavl, Russia, October 1999.
- Organizing Committee, *International Committee for Future Accelerators Seminar*, Fermilab, October 1999.
- Advisory Committee, The 4th RESCEU International Symposium on "The Birth and Evolution of the Universe," Tokyo, Japan, November, 1999.
- Organizer, Inner Space/Outer Space, Fermilab, Batavia, IL, May 1999.
- Organizer, SUSY '99, Fermilab, Batavia, IL, June 1999.

- Organizer, Fundamental Physics from Space, Sonoma CA, October 1999.
- Organizer, Aspen Winter School on Astrophysics, January 2000.
- International Advisory Board, *Nuclei in the Cosmos 2000*, Aarhus, Denmark, June 2000.
- International Advisory Committee, Summer School on Particle Astrophysics, International Center for Theoretical Physics, Trieste, Italy, June 2000
- International Advisory Committee, COSMO 2000, Seoul, Korea, October, 2000.
- International Advisory Committee, Frontiers in Particle Astrophysics and Cosmology, Valencia, Spain, October 2000.
- Organizing Committee, VII International Workshop on Advanced Computing and Analysis Techniques in Physics Research, Fermilab, October 2000.
- Advisory Committee, Frontiers in Contemporary Physics II, Nashville, TN, March 2001.
- International Advisory Committee, XXth International Symposium on Lepton and Photon Interactions at High Energy, Rome, Italy, July 2001.
- International Advisory Committee, COSMO'01, Rovaniemi, Finland, September 2001.
- Advisory Committee, 11th International Baksan School "Particles and Cosmology", Baksan Valley, Kabardino-Balkaria, Russia, April 2001.
- International Committee, Xth Brazilian School of Cosmology and Gravitation, Rio de Janeiro, Brasil, July 2002.
- Advisory Committee, XIVth Rencontres de Blois, Blois, France, June 2002.
- International Organizing Committee, International Workshop on Neutrinos and Subterranean Science, September 2002, Washington, DC

INVITED PRESENTATIONS AT CONFERENCES

- 1980 Neutrino Mass Conference, Telemark, Wisconsin, October 1980
- Orbis Scientiae 1981, Coral Gables, Florida, January 1981
- Early Universe Workshop, Santa Barbara, California, May 1981
- V Johns Hopkins Workshop, Baltimore, Maryland, June 1981
- VIII International Conference on Neutrino Physics and Astrophysics, Maui, Hawaii, July 1981
- Third Marcel Grossman Conference on Recent Developments in Gravitation, Shanghai, China, August 1982
- 1982 Neutrino Mass Conference, Telemark, Wisconsin, October 1982
- XI Texas Symposium on Relativistic Astrophysics, Austin, Texas, December 1982
- Orbis Scientiae 1983, Coral Gables, Florida, January 1983
- Monopole '83, Ann Arbor, Michigan, October 1983
- Early Universe Workshop (est Conference) San Francisco, California, January 1984
- First Equatorial School on Relativistic Astrophysics, Bogota, Colombia, February 1984
- VIII Johns Hopkins Workshop, Baltimore, Maryland, June 1984
- NATO Conference on Phase Transitions in the Very Early Universe, Bielefeld, West Germany, June 1984
- XI International Conference on Neutrino Physics and Astrophysics, Dortmund, West Germany, June 1984
- IV Brazilian School on Cosmology and Gravitation, Rio de Janeiro, Brazil, July 1984
- American Physical Society (DPF) Santa Fe, New Mexico, November 1984
- Early Universe Workshop, Rutherford Laboratory, England, March 1985
- Superconducting Super Collider Users Meeting, Berkeley, California, May 1985
- IX Johns Hopkins Workshop, Florence, Italy, June 1985
- Fourth Marcel Grossmann Meeting on Recent Developments in General Relativity, Rome, Italy June 1985
- Particles and the Universe, Thessaloniki, Greece, June 1985

- Summer Workshop on High Energy Physics and Cosmology, Trieste, Italy, June-July 1985
- Physics in Collision, Autun, France, July 1985
- Aspen Winter Conference, Aspen, Colorado, January 1986
- International School of Particle Astrophysics, Erice, Sicily, May 1986
- XVII International Seminar on Theoretical Physics, Peniscola, Spain, June 1986
- International Symposium on Weak and Electromagnetic Interactions in Nuclei, Heidelberg, West Germany, July 1986
- Theoretical Advanced Studies Institute, Santa Cruz, California, July 1986
- Cargese NATO Advanced Studies Institute on Gravitation in Astrophysics, Cargese, Corsica, July 1986
- Astroparticle Physics Meeting, Rome, Italy, November 1986
- Second Mexican School on Particles and Fields, Cuernavaca, Mexico, December 1986
- APS/DPF Meeting, Salt Lake City, Utah, January 1987
- APS/AAPT Meeting, San Francisco, California, January 1987
- Early Universe Workshop, Baltimore, Maryland, March 1987
- Heavenly Accelerators Workshop, Baltimore, Maryland, March 1987
- Neutrino masses and Astrophysics, Ashland, Wisconsin, March 1987
- Vth Brazilian School on Cosmology, Rio de Janeiro, Brazil, July 1987
- American Chemical Society “Symposium on the Origin and Distribution of the Elements,” New Orleans, Louisiana, August 1987
- First Italian/Korean Joint Symposium on Relativistic Astrophysics, Seoul, South Korea, September 1987
- MASUA Theoretical Physics Conference, Lawrence, Kansas, October 1987
- XVth Yamada Conference, Tokyo, Japan, March 1988
- Japan Physical Society Spring Meeting, Koriyama, Japan, April 1988
- Fifth Marcel Grossmann Meeting on Recent Developments in General Relativity, Perth, Australia, August 1988

- CP Violation in Particle Physics and Astrophysics, Château de Blois, France, May 1989.
- Inflation and Exotic Structure Formation, Vancouver, Canada, May 1990.
- The Birth and Early Evolution of Our Universe—Nobel Symposium 79, Gräftåvallen, Östersund, Sweden, June 1990.
- Primordial Nucleosynthesis and the Origin and Evolution of the Early Universe, Tokyo, Japan, August 1990.
- International School of Particle Astrophysics, Houston, Texas, January, 1991.
- Le Rencontres de Physique, La Thuile, Italy, March 1991.
- International School Particles and Cosmology, Baksan, USSR, May 1991.
- Lepton Photon — High Energy Physics Meeting, Geneva, Switzerland, July, 1991.
- Nuclear Astrophysics Symposium, Pasadena, California, August, 1991.
- DPF91, Vancouver, Canada, August, 1991.
- UCLA High-Energy Neutrino and Gamma-Ray Astrophysics Meeting, Los Angeles, California, February, 1992.
- Third International Symposium on Neutrino Telescopes, Venice, Italy, March, 1992
- Workshop on Dynamics of First Order Phase Transitions, Jülich, Germany, June, 1992.
- IVth Recontres de Blois Particle Astrophysics, Blois, France, June, 1992.
- Lecturer, International School of Astrophysics “D. Chalonge,” Erice, Italy, September, 1992.
- Le Rencontres de Physique, La Thuile, Italy, March 1993.
- 11th Capri Symposium on Certainties and Doubts in Elementary Particles, Capri, Italy, May 1993.
- Evolution of the Universe and Its Observational Quest, Tokyo, Japan, June 1993
- Lecturer, Summer Course on Astrophysics and Particle Physics, Eötvös University, Budapest, Hungary, July 1993.
- 3rd Portuguese Meeting in Astronomy and Astrophysics, Lisbon, Portugal, July 1993.
- 42nd Scottish Universities Summer School in Physics, St. Andrews, Scotland, August 1993.

- Coral Gables Conference, Coral Gables, Florida, January 1994
- Birth of the Universe and Its Observational Quest, Rome, May 1994
- Frontier Objects in Astroparticle Physics, Vulcano, Italy, May 1994
- Rapporteur, XXVIIth International Conference on High Energy Physics (Rochester Meeting), Glasgow, Scotland, August 1994
- Rapporteur, VIIth Marcel Grossmann Meeting on General Relativity, Palo Alto, CA., August 1994
- XVIIth Johns Hopkins Workshop on Current Problems in Elementary Particle Theory, Florence, Italy, August 1994
- Trends in Astroparticle Physics, Nobel Symposium, Stockholm, September 1994
- Coral Gables Conference, Coral Gables, Florida, February, 1995
- Le Rencontres de Physique, La Thuile, Italy, March 1995.
- Frontiers of Particle Physics, Valencia, Spain, June 1995.
- Non-Accelerator Particle Astrophysics School, International Centre for Theoretical Physics, Trieste, Italy, July 1995.
- International School of Physics “Enrico Fermi” Dark Matter in the Universe, Varenna, Italy, July 1995
- The Very Early Universe Conference, Gaeta, Italy, August 1995
- TAN Summer School and Workshop in Astroparticle Physics, Vigso, Denmark, August 1995
- 16th UK Institute for Theoretical High Energy Physicists, Swansea, U.K., August 1995
- The Cosmological Constant and the Evolution of the Universe, Tokyo, Japan, November 1995
- Orbis Scientiae 1996, Miami, Florida, January, 1996.
- Sources and Detection of Dark Matter, Santa Monica, California, February, 1996.
- Neutrino Telescopes, Venice, Italy, February, 1996.
- Le Rencontres de Physique, La Thuile, Italy, March 1996.
- International Seminar Quarks '96, Yaroslavl, Russia, May 1996.
- Second German-American Frontiers of Science Symposium, Woods Hole, Massachusetts, June 1996.

- Neutrinos, Dark Matter, and the Universe, Blois, France, June 1996.
- Astrofundamental Physics, Erice, Italy, September 1996.
- Orbis Scientiae 1996, Miami, Florida, January 1997.
- Frontiers in Contemporary Physics, Nashville, May 1997.
- Birth of the Universe and Fundamental Physics, Rome, Italy, May 1997.
- Beyond the Desert, Tegernese, Germany, June 1997.
- Nathagali Summer College on Physics and Contemporary Needs, Islamabad, Pakistan, July 1997
- British Universities Summer School in Theoretical Elementary Particle Physics, Sussex, England, September 1997.
- International Workshop on Particle Physics and the Early Universe, COSMO-97, Ambleside, England, September 1997.
- 26th Coral Gables Meeting, Miami, Florida, December 1997.
- XXXIIIrd Rencontres de Moriond, Les Arcs, France, January 1998.
- World Economic Forum, Davos, Switzerland, January 1998.
- 3rd Santa Monica Meeting on Sources and Detection of Dark Matter, Santa Monica, February, 1998.
- Particles, Strings, and Cosmology, Boston, March 1998
- Cosmology and Particle Physics, CERN, June 1998
- St. Croix Summer School in Experimental Elementary Particle Physics, St. Croix, US Virgin Islands, June 1998
- The Birth of Galaxies, Xth Rencontres de Blois, Blois, France, June–July 1998
- DARK'98, Dark Matter in Astro and particle Physics, Heidelberg, Germany, July 1998
- International Conference on High Energy Physics, plenary lecture and public lecture, Vancouver, Canada, July 1998
- Particle Physics and the Universe—Nobel Symposium, Haga Slott, Sweden, August 1998
- GAAC Young Scholars Institute, Aspen, Colorado, September 1998
- COSMO'98, Asilomar, October 1998

- Pritzker Symposium on the Status of Inflationary Cosmology, Chicago, January 1999
- AAAS Cosmic Questions, Smithsonian, Washington DC, April 1999
- Centennial Meeting of the American Astronomical Society, Chicago, June 1999.
- 23rd Johns Hopkins Workshop on Current Problems in Particle Theory, Baltimore, June 1999
- Universe '99, Toronto, Canada, July 1999
- Newton Institute Program, Cambridge, England, August 1999
- Modern Cosmology & Inflation, Erice, Sicily, August 1999
- TAUP Conference, Paris, France, August 1999
- COSMO-99, Trieste, Italy, September 1999
- DESY-theory-workshop, Hamburg, Germany, October 1999
- Fundamental Physics from Space, Sonoma CA, October 1999
- RESCEU Symposium, Tokyo, Japan, November 1999
- Chalonge School, Erice, Sicily, December 1999
- Aspen Astrophysics Winter Meeting, Aspen, CO, January 2000.
- Pacific Northwest Association of Physics Teachers, Portland, OR, April 2000.
- ICTP Summer School on Particle Astrophysics, Trieste, June 2000.
- CITA K2K, Toronto, August 2000.
- COSMO2K, Cheju Island, Korea, September 2000.
- Historical Development of the Big Bang, Valencia, Spain, September 2000.
- Audouze & Truran Meeting, IAP, Paris, France, November 2000.
- Frontiers in Contemporary Physics, Nashville TN, March 2001.
- Matter in the Universe, Bern, Switzerland, March 2001.
- PASCOS, Chapel Hill NC, April 2001.
- Physics 2001, Puerto Rico, May 2001
- CMB Polarization, Chicago IL, May 2001
- Lepton-Photon Meeting, Rome, Italy July 2001

- International Conference on High-Energy Physics, Hamburg, Germany, August 2001.
- COSMO'01, Rovaniemi, Finland, September 2001.
- Advances in Cosmology, Seoul, Korea, October 2001.

SCIENTIFIC PUBLICATIONS—JOURNALS

1. “Neutrino Pair Bremsstrahlung Including Neutral Current Effects,” (with D.A. Dicus, D.N. Schramm, D.L. Tubbs) *Astrophys. J.* **210**, 481 (1976).
2. “Stellar Energy Loss Rates Due to S, P, or T Neutral Currents,” (with D.A. Dicus) *Phys. Rev. D* **15**, 977 (1977).
3. “Reaction Rate, Weak Corrections, and Background in $e^+ e^- \rightarrow \pi^0 \gamma, \eta \gamma$,” (with D.A. Dicus, V.L. Teplitz) *Phys. Rev. D* **15**, 1286 (1977).
4. “Cosmological Upper Bounds on Heavy Neutrino Lifetimes,” (with D.A. Dicus, V.L. Teplitz) *Phys. Rev. Lett.* **39**, 168 (1977).
5. “Limits From Primordial Nucleosynthesis on the Properties of Massive Neutral Leptons,” (with D.A. Dicus, V.L. Teplitz, R.V. Wagoner) *Phys. Rev. D* **17**, 1529 (1978).
6. “Cosmological Implications of Massive, Unstable Neutrinos,” (with D.A. Dicus, V.L. Teplitz) *Astrophys. J.* **221**, 327 (1978).
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